

REMARKS

Reconsideration of the above-identified patent application, as amended, is respectfully requested.

Claims 1-46 stand rejected under 35 U.S.C. § 101 as being directed to non-statutory subject matter. Claims 1-3, 14, 16, 22-29, 34, 36, 38, 45, and 46 stand rejected under 35 U.S.C. § 102(b) as being anticipated by the article authored by Akin et al. entitled Rule-Based Fuzzy Logic Control for a PWR-Type Nuclear Power Plant. Claims 4-13, 15, 17-21, 30-33, 35, 37, and 39-44 are objected to as being dependent upon a rejected base claim but are indicated as being allowable if amended in independent form including all of the limitations of the base claim and any intervening claims.

Regarding the § 101 rejection of claim 1, applicants assert that claim 1 recites statutory subject matter. If a claim defines a useful machine or manufacture by identifying the physical structure of the machine or manufacture in terms of its hardware or hardware and software combination, it defines a statutory product (MPEP § 2106(IV)(B)(2)(a) at 2100-14). A claim limited to a machine or manufacture, which has a practical application in the technological arts, is statutory (MPEP § 2106(IV)(B)(2)(a) at 2100-15). Contrary to the Examiner's assertion, the system of claim 1 discloses a hardware and software combination with a practical application and is thus recites statutory subject matter. The 35 U.S.C. § 101 rejection of applicants' claim 1 should therefore be withdrawn.

Applicants' claim 1 recites a system that uses a combination of hardware and software to estimate a set of mathematical model parameters. Claim 1 recites at least

one sensor configured to produce sensory data. Claim 1 further recites a control circuit that uses the sensory data to maintain a mathematical model and to estimate a set of mathematical model parameters. Claim 1 thus clearly identifies physical structure of the system's hardware and software combination as well as a use of that structure. Furthermore, the claimed control circuit transforms the sensor data produced by the at least one sensor into computer data, and as set forth below with respect to the discussion of claim 26, claim 1 therefore recites statutory subject matter (MPEP § 2106(IV)(B)(2)(b)(i) at 2100-16:17).

Applicants' claims 2-25 depend on claim 1 and are therefore believed to be directed to statutory subject matter for the same reasons given above with respect to claim 1. For these reasons, withdrawal of the § 101 rejection of claims 1-25 as being directed to non-statutory subject matter is respectfully requested.

Regarding the § 101 rejection of claims 26 and 46, applicants assert that these claims recite statutory subject matter. A statutory process is one that requires the measurements of physical objects or activities be transformed outside of the computer into computer data where the data comprises signals corresponding to physical objects or activities external to the computer system, and where the process causes the physical transformation of the signals which are intangible representations of the physical objects or activities (MPEP § 2106(IV)(B)(2)(b)(i) at 2100-16:17). The methods disclosed in claim 26 and claim 46 each involve the transformation of data which are intangible representations of physical activities or objects, and are thus directed to statutory subject matter. The 35 U.S.C. § 101 rejection of applicants' claims should therefore be withdrawn.

Applicants' claim 26 discloses a method for estimating a set of model parameters based on the values of a number of system operating conditions. The values are generated by at least one sensor operable to sense and produce sensory data of an operating condition of the system (p. 4, lines 28-31, Fig. 1). Applicants have herein amended claim 26 to more clearly set forth that sensory data from at least one sensor is used in the step determining the system operating conditions.

A statutory process is one that manipulates data representing physical objects or activities (MPEP § 2106(IV)(B)(2)(b)(i) at 2100-16). The sensor of claim 26 produces a signal which corresponds to a physical object or activity external to the model. The sensory data, which is an intangible representation of a physical object or activity, is manipulated and used to estimate the set of mathematical model parameters. By manipulating and using the intangible representations of physical activities or objects, claim 26 thus recites statutory subject matter.

Applicants' claims 27-45 depend on claim 26 and are therefore believed to be directed to statutory subject matter for the same reasons given above with respect to claim 26. For these reasons, withdrawal of the § 101 rejection of claims 26-45 as being directed to non-statutory subject matter is respectfully requested.

Applicants' claim 46 discloses a method for estimating a set of model parameters based on sensory data from a number of data sensors. As discussed above, a statutory process is one that manipulates data representing physical objects or activities. The data sensors of claim 46 produce sensory data which corresponds to physical objects or activities external to the model. The sensory data, which is an intangible representation of physical objects or activities, is manipulated and used to estimate the set of

mathematical model parameters. By manipulating and using the intangible representations of physical activities or objects, claim 46 is thus directed to statutory subject matter. For this reason, withdrawal of the § 101 rejection of claim 46 as being directed to non-statutory subject matter is respectfully requested.

Regarding the § 102(b) rejection of claims 1, 26, and 46, applicants assert that Akin et al. do not anticipate these claims. A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently, in a single prior art reference, and the identical invention must be shown in as complete detail as is contained in the claim (MPEP § 2131). Contrary to the Examiner's statements, each element of the applicants' claims is not disclosed by Akin et al., and the 35 U.S.C. § 102(b) rejection of applicants' claims should therefore be withdrawn.

Akin et al. disclose a rule-based fuzzy logic controller for a model of a nuclear power plant (see, for example, p. 883, abstract). Akin et al. discuss the model in terms of a number of mathematical equations set forth at p. 883, col. 2, par. 2. Akin et al. also discuss the development of fuzzy logic sets, their ranges, and corresponding membership functions (p. 884, col. 2, par. 1; Tables I, II, and III). Simulated sensor data is applied to the model to generate a number of model outputs (p. 885, col. 1, par. 2). The model outputs are then subjected to the fuzzy logic sets and membership functions to determine an output of the fuzzy logic controller (p. 885, col. 2, par. 1). Akin et al. do not disclose that any one or more of the model parameters disclosed at p. 883, col. 2, par. 2 are determined as a function of any one or more of the fuzzy logic sets, membership functions, the output of the fuzzy logic controller or the simulated sensor data. Rather, the model disclosed at p. 883, col. 2, par. 2 is described by Akin et al. as

being “the multiinput mathematical model formulated and validated against experimental results by Kerlin et al. [2] for predicting the dynamic response of the H. B. Robinson nuclear power plant (NPP) during full power operation,” and the model parameters recited at p. 883, col. 2, par. 2 therefore appear to be static; i.e., constant.


Applicants’ claim 1, in contrast, requires the controller to be responsive to a number of system operating conditions, including sensory data produced by at least one sensor, to update a group of matrix cells of a data matrix, and to estimate a set of mathematical model parameters based on the updated data matrix. Applicants’ amended claim 26 similarly requires updating a selected group of matrix cells of a data matrix based on values of a number of system operating conditions, including sensory data produced by at least one sensor, and estimating a set of mathematical model parameters based on the updated matrix. Applicants’ claim 46 similarly requires updating a selected row of matrix cells of a data matrix based on sensory data received from a number of data sensors, and estimating a set of mathematical model parameters based on the updated matrix. Each of applicants’ independent claims 1, 26 and 46 thus require estimating the model parameters based on a data matrix that is updated using sensory data produced by at least one data sensor. Akin et al. do not disclose this feature. Rather, as discussed hereinabove, the Akin et al. model parameters are static and therefore do not change. Akin et al. disclose that the model produces model output values in response to inputs in the form of simulated sensor data, but Akin et al. do not disclose that any sensor data, simulated or actual, are used to change one or more of the model parameters as required by each of applicants’ independent claims 1, 26 and

46. By failing to show or disclose this limitation, either expressly or inherently, Akin et al. thus fail to anticipate any of applicants' claims 1, 26 or 46.

Applicants' claims 2, 3, 14, 16, and 22-25 depend on claim 1 and are therefore believed to be allowable over Akin et al. for the same reasons given above with respect to claim 1. Applicants' claims 27-29, 34, 36, 38, and 45 depend on claim 26 and are therefore believed to be likewise allowable over Akin for the same reasons given above with respect to claim 26. For at least the reasons set forth herein, withdrawal of the § 102(b) rejection of claims 1-3, 14, 16, and 22-29, 34, 36, 38, and 45-46 as being anticipated by Akin et al. is respectfully requested.

All of the rejections of claims 1-46 have been traversed. Claims 1-46 are believed to be in condition for allowance, and such action is solicited. The Examiner is cordially invited to contact the undersigned by telephone to discuss any unresolved matters.

Respectfully submitted,



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